WHAT IS CLAIMED IS:

1. An apparatus comprising:

a mixer for mixing a received signal and a local oscillator signal and generating an analog, frequency converted signal, and

an analog-to-digital converter for converting the analog, frequency-converted signal into a corresponding digital signal,

wherein a frequency of the local oscillator signal is an integer multiple of half of a sampling rate of the analog-to-digital converter.

2. The apparatus in claim 1, wherein the frequency of the local oscillator signal is one half of the sampling rate of the analog-to-digital converter.

3. The apparatus in claim 1, wherein the frequency of the local oscillator signal F_{LO} is $F_{LO} = n * F_{ADC} / 2$, where F_{ADC} is the sampling rate of the analog-to-digital converter, and n is a positive integer.

4. The apparatus in claim 1, further comprising:

an oscillator for generating a periodic signal,

wherein the periodic signal is used to generate both the local oscillator signal and a sampling rate signal for the analog-to-digital converter.

5. The apparatus in claim 4, further comprising:

a frequency changer, receiving the periodic signal from the oscillator, for providing the local oscillator signal to the mixer and a sampling rate signal to the analog-to-digital converter.

6. The apparatus in claim 5, wherein the frequency changer includes a first frequency divider for dividing the periodic signal in half to generate the local oscillator signal and for dividing the periodic signal by an integer to generate the sampling rate signal of the analog-to-digital converter.

7. The apparatus in claim 1, wherein the apparatus is used in a receiver without a filter between the mixer and the analog-to-digital converter.

8. The apparatus in claim 1, wherein the apparatus is used in a receiver with a filter between the mixer and the analog-to-digital converter.

9. The apparatus in claim 1, wherein the analog, frequency-converted signal from the mixer is coupled directly to the analog-to-digital converter.

10. A radio receiver comprising:

an antenna;

a front end for processing a radio frequency signal received via the antenna;

a mixer for mixing a received signal from the front end and a local oscillator signal for generating an analog, frequency-converted signal;

an analog-to-digital converter for converting the analog, frequency-converted signal into a corresponding digital signal; and

digital processing circuitry for processing the digital signal,

wherein a frequency of the local oscillator signal is an integer multiple of half of a sampling rate of the analog-to-digital converter.

11. The receiver in claim 10, wherein the frequency of the local oscillator signal is one half of the sampling rate of the analog-to-digital converter.

12. The receiver in claim 10, wherein the frequency of the local oscillator signal F_{LO} is $F_{LO} = n * F_{ADC} / 2$, where F_{ADC} is the sampling rate of the analog-to-digital converter, and n is a positive integer.

13. The receiver in claim 10, further comprising:

an oscillator for generating a periodic signal,

wherein the periodic signal is used to generate both the local oscillator signal and a sampling rate signal for the analog-to-digital converter.

14. The receiver in claim 13, further comprising:

a frequency changer, receiving the periodic signal from the oscillator, for providing the local oscillator signal to the mixer and a sampling rate signal to the analog-to-digital converter,

wherein the frequency of the local oscillator signal is one half of the sampling rate of the analog-to-digital converter.

15. The receiver in claim 10, further comprising:

a filter between the mixer and the analog-to-digital converter.

16. The receiver in claim 10, wherein the mixer is directly coupled to the analog-to-digital converter.

17. An apparatus comprising:

a mixer for mixing a received signal and a local oscillator signal for generating an analog, frequency-converted signal, and

an analog-to-digital converter for converting the analog, frequency-converted signal into a corresponding digital signal,

wherein the analog, frequency-converted signal is connected directly to an input of the analog-to-digital converter.

18. The apparatus in claim 17, wherein a frequency of the local oscillator signal is an integer multiple of half of a sampling rate of the analog-to-digital converter.

19. The apparatus in claim 17, wherein the frequency of the local oscillator signal is one half of the sampling rate of the analog-to-digital converter.

20. The apparatus in claim 17, wherein the frequency of the local oscillator signal F_{LO} is $F_{LO} = n * F_{ADC} / 2$, where F_{ADC} is the sampling rate of the analog-to-digital converter, and n is a positive integer.

21. The apparatus in claim 17, further comprising:

an oscillator for generating a periodic signal,

wherein the periodic signal is used to generate both the local oscillator signal and a sampling rate signal for the analog-to-digital converter.

22. The apparatus in claim 21, further comprising:

a frequency changer, receiving the periodic signal from the oscillator, for providing the local oscillator signal to the mixer and a sampling rate signal to the analog-to-digital converter.

23. The apparatus in claim 17, wherein a low impedance output of the mixer is coupled directly to the analog-to-digital converter without an impedance matching network.

24. An apparatus comprising:

a mixer for mixing a received signal and a local oscillator signal to generate an analog, frequency-converted signal, and

an analog-to-digital converter for converting the analog, frequency-converted signal into a corresponding digital signal,

wherein a frequency of the local oscillator signal is related to a sampling rate of the analog-to-digital converter to prevent aliasing that would otherwise result from the mixing and converting.

25. The apparatus in claim 24, wherein the frequency of the local oscillator signal is an integer multiple of half of the sampling rate of the analog-to-digital converter.

26. The apparatus in claim 24, wherein the frequency of the local oscillator signal F_{LO} is $F_{LO} = n * F_{ADC} / 2$, where F_{ADC} is the sampling rate of the analog-to-digital converter, and n is a positive integer.

27. The apparatus in claim 24, wherein the apparatus is used in a receiver without a filter between the mixer and the analog-to-digital converter.

28. The apparatus in claim 24, wherein the apparatus is used in a receiver with a filter between the mixer and the analog-to-digital converter.

29. The apparatus in claim 24, wherein the analog, frequency-converted signal from the mixer is coupled directly to the analog-to-digital converter.

30. A method comprising:

receiving an analog signal;

mixing the received signal and a local oscillator signal to generate an analog, frequency-converted signal, and

converting the analog, frequency-converted signal into a corresponding digital signal using a sampling rate signal,

wherein a frequency of the local oscillator signal is an integer multiple of half of a frequency of the sampling rate signal.

31. The method in claim 30, wherein the frequency of the local oscillator signal is one half of the frequency of the sampling rate signal.

32. The method in claim 30, wherein the frequency of the local oscillator signal F_{LO} is $F_{LO} = n * F_{ADC} / 2$, where F_{ADC} is the frequency of the sampling signal, and n is a positive integer.

33. The method in claim 30, further comprising:

determining a receive frequency band for the received signal and a sampling rate range for the analog to digital conversion;

defining limits for the frequency of the local oscillator signal in accordance with the receive frequency band and the frequency of the sampling signal in accordance with the sampling rate range; and

selecting, within the defined limits, the frequency of the local oscillator signal and the frequency of the sampling rate signal so that the frequency of the local oscillator signal is an integer multiple of half of the frequency of the sampling rate signal.

34. The method in claim 30, wherein the converting is performed without filtering the analog, frequency-converted signal.